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Class - 10

Chapter - 3

Metals And Non-Metals

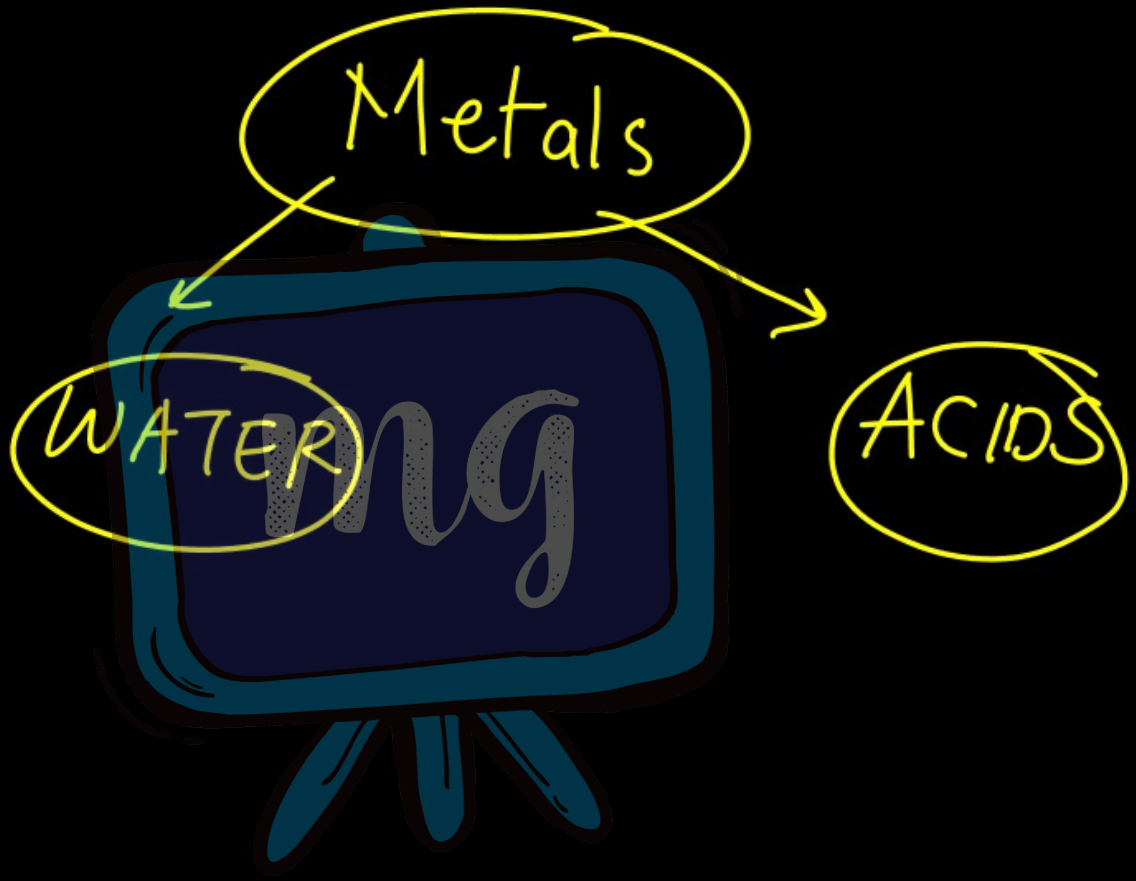
Part-3

Chemical Properties of Metal

Disha Didi (DD)

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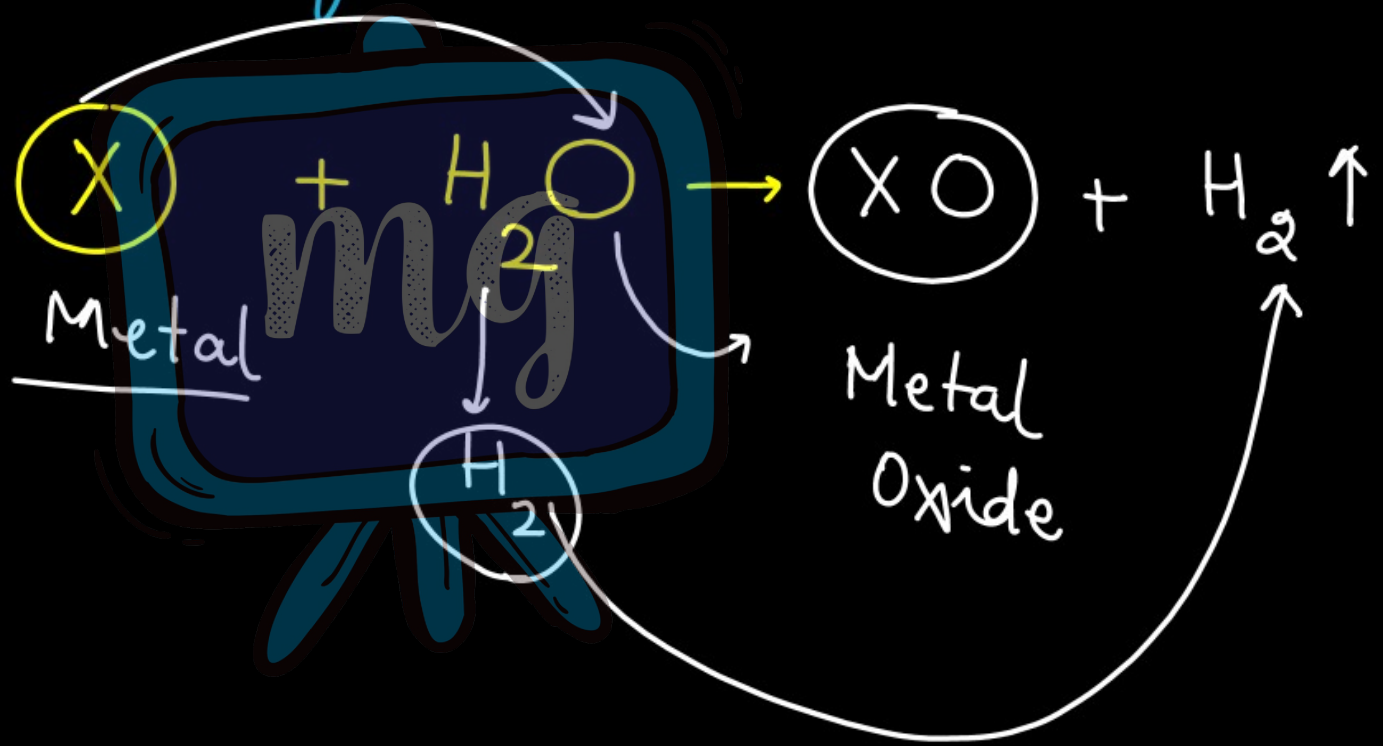
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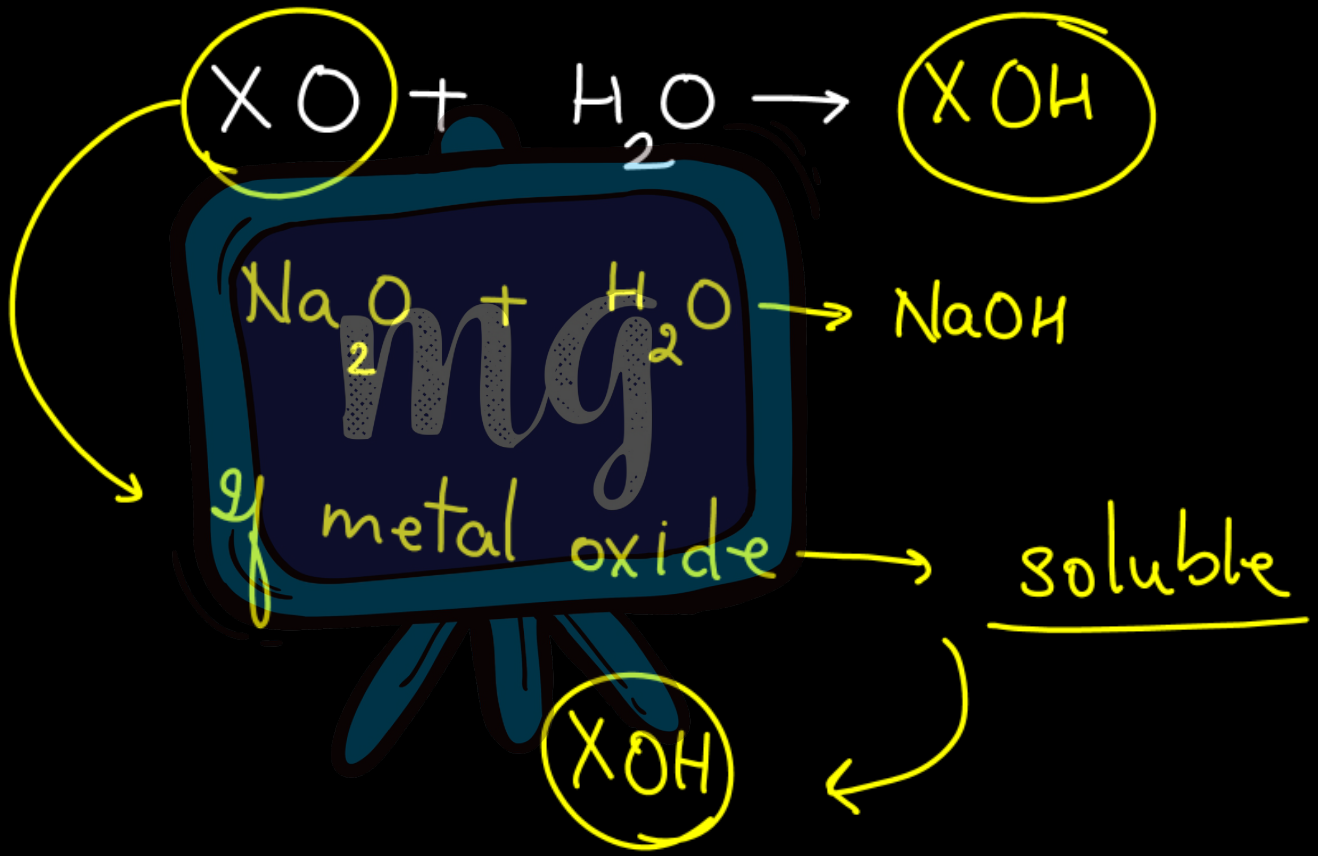
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Reaction of Metal with water :



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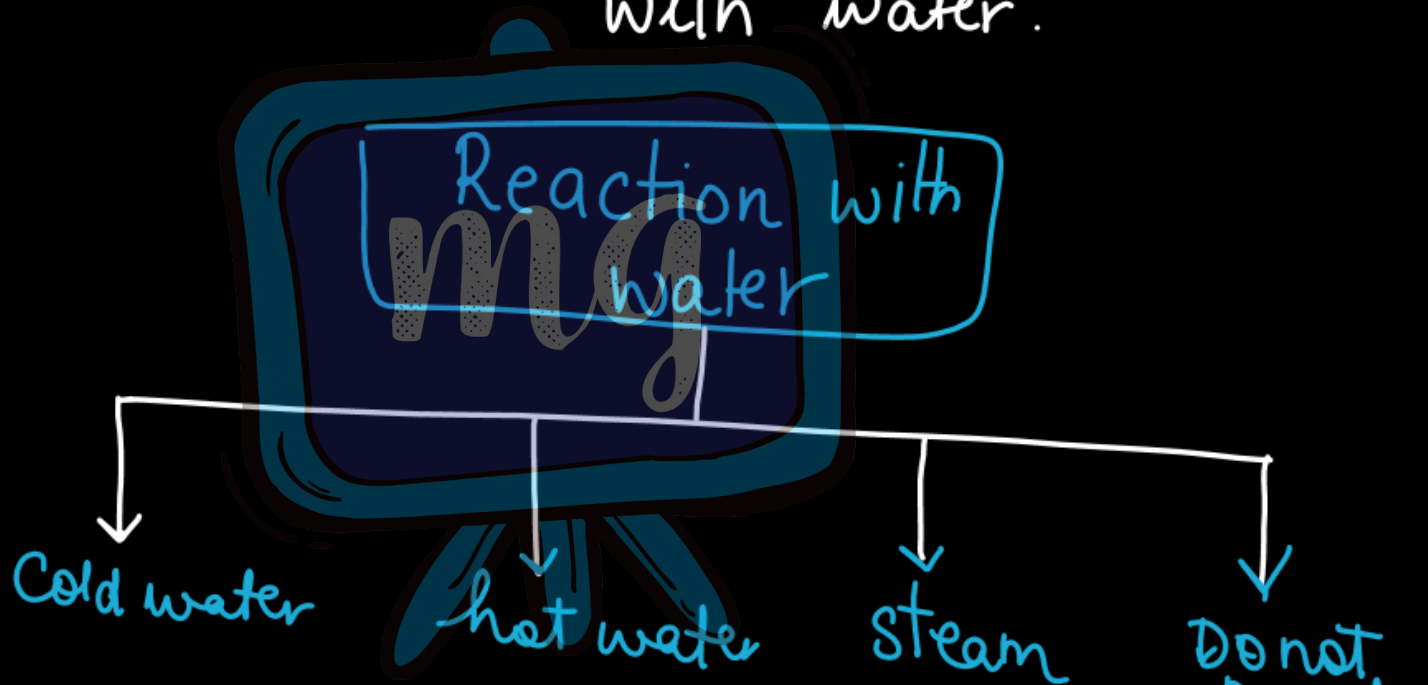


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X →

All metals do not react with water.



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Metals → Cold Water.

1) $K(s) + H_2O(l) \longrightarrow KOH + H_2 + \Delta$

EXOTHERMIC

2) $Na(s) + H_2O \longrightarrow NaOH + H_2 + \Delta$

fire

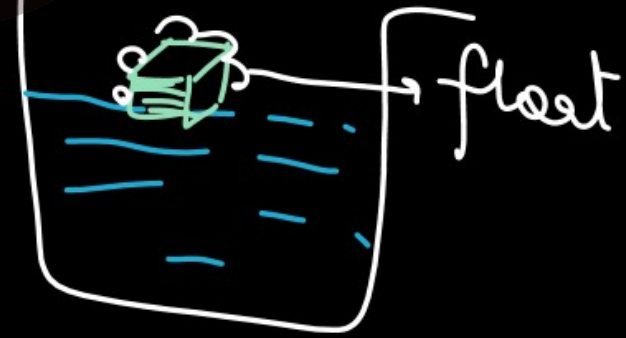
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K ; Na → सर्रे

3) $Ca(s) + H_2O \rightarrow Ca(OH)_2 + H_2\uparrow$

" NO FIRE "



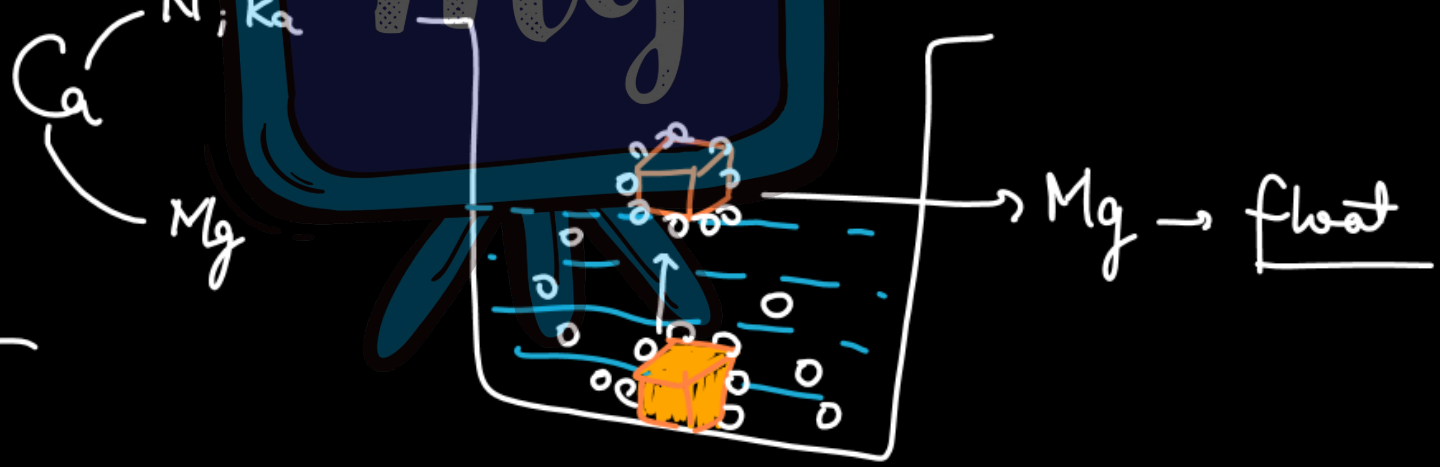
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Metal → Hot Water

$$Mg_{(s)} + H_2O_{(l)} \rightarrow Mg(OH)_2 + H_2$$

Ca — N ; Ka
Mg



Mg → float

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Metal ⟶ Steam

Sauna

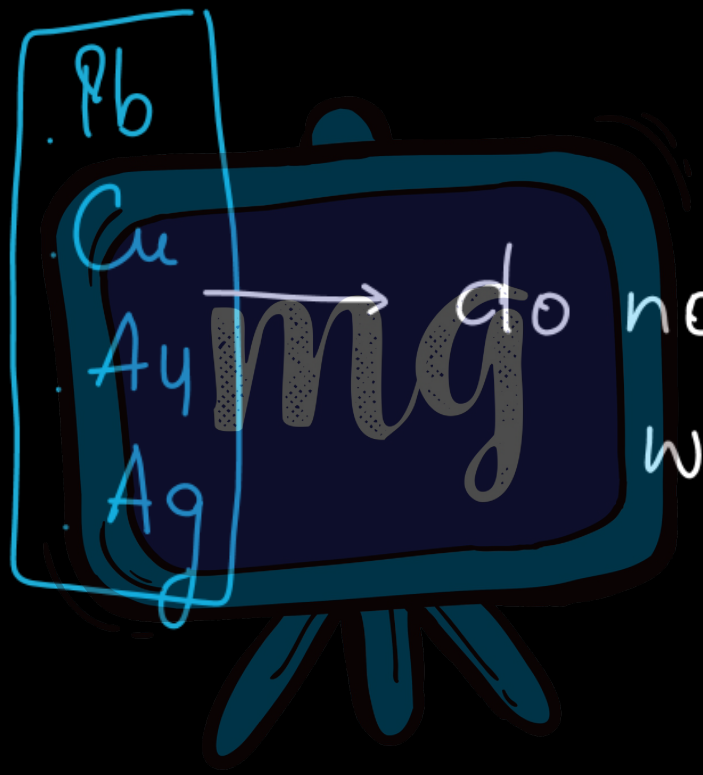
$$Al_{(s)} + H_2O_{(g)} \rightarrow Al_2O_3 + H_2\uparrow$$

$$Fe_{(s)} + H_2O_{(g)} \rightarrow Fe_3O_4 + H_2\uparrow$$

$$Zn_{(s)} + H_2O_{(g)} \rightarrow ZnO + H_2\uparrow$$

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→ do not react water.

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Cold	Hot	Steam	Do not React
Na	Mg	AL	Pb
K		Fe	Cu
Ca		Zn	Ay
			Ag



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B. Reaction of Metal with Water —

- Metal + Water → Metal oxide + Hydrogen

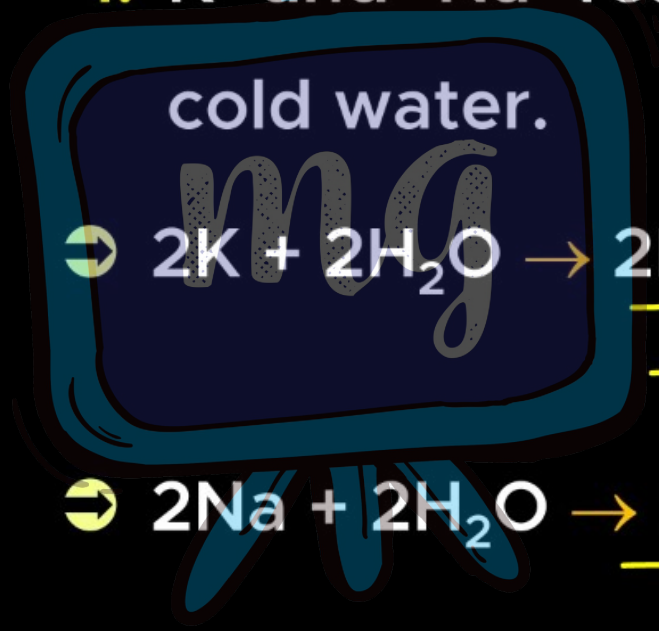
- Metal oxides + Water → Metal hydroxide

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Reactivity of Different Metals —

1. K and Na react violently with cold water.



Fire

$2K + 2H_2O \rightarrow 2KOH + H_2 + Heat$

— Para ↑

$2Na + 2H_2O \rightarrow 2NaOH + H_2 + Heat$

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2. Reaction of calcium with water is less violent.

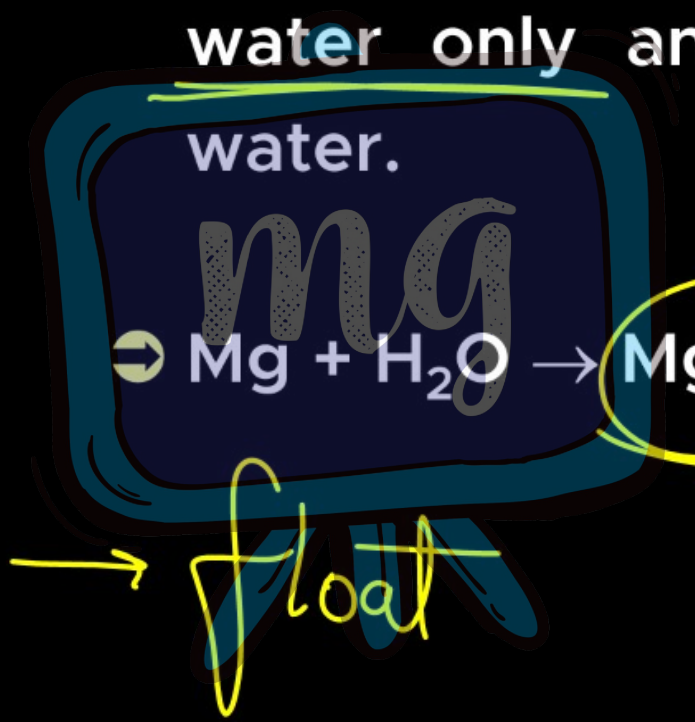
$Ca + 2H_2O \rightarrow Ca(OH)_2 + H_2$

- Heat evolved is not enough for H_2 to catch fire.
- Calcium starts floating because the bubbles of hydrogen gas stick to surface of metal

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3. Magnesium reacts with hot water only and not with cold water.



➲ $Mg + H_2O \rightarrow Mg(OH)_2 + H_2$

→ float

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4. Aluminium, iron, zinc react with steam to form metal oxide and hydrogen.

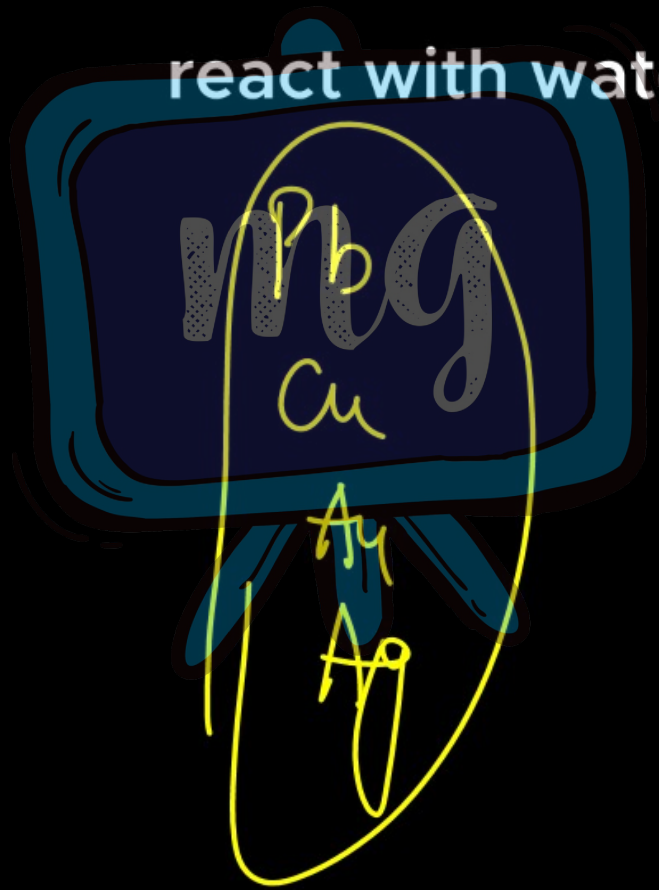
Steam

- $2Al + 3H_2O \rightarrow Al_2O_3 + 3H_2$
- $3Fe + 4H_2O \rightarrow Fe_3O_4 + 4H_2$

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5. Lead, copper, silver, gold do not react with water.



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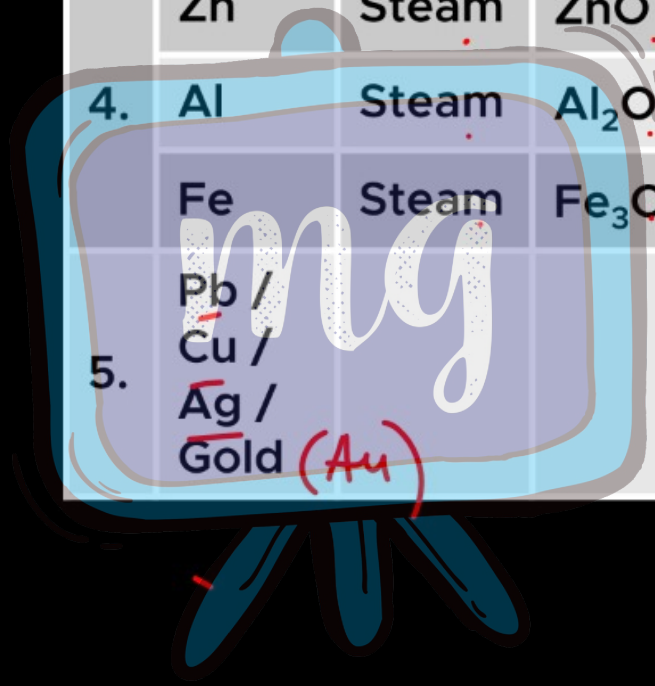
REACTION OF METAL WITH WATER

	Metal	Water	Product	Remarks
1.	K	Cold	$KOH + H_2 + \Delta$	Violent Reaction Exothermic
	Na	Cold	$NaOH + H_2 + \Delta$	
2.	Ca	Cold	$Ca(OH)_2 + H_2$	Less Violent Calcium floats on water surface
3.	Mg	Hot	$Mg(OH)_2 + H_2$	Magnesium floats

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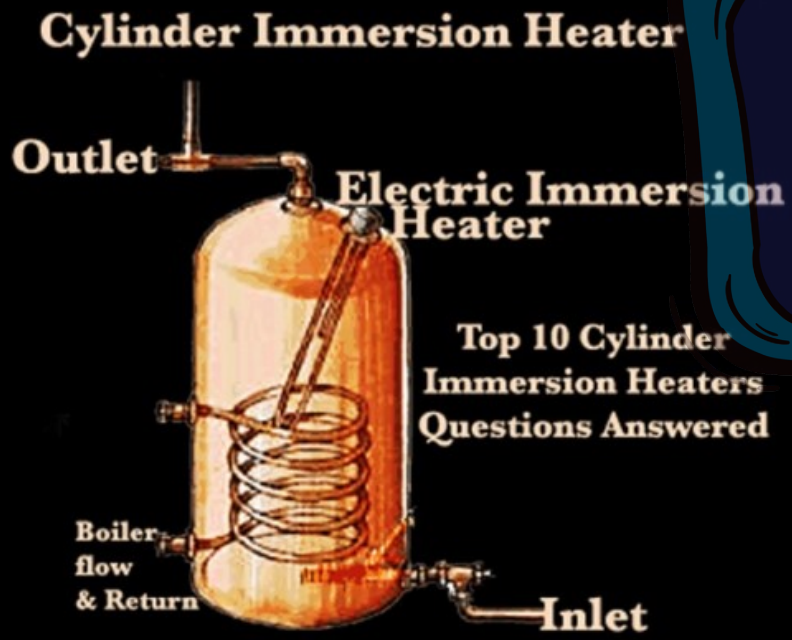
	Metal	Water	Product	Remarks
	Zn	Steam	$ZnO + H_2$	Reacts only with steam
4.	Al	Steam	$Al_2O_3 + H_2$	
	Fe	Steam	$Fe_3O_4 + H_2$	
5.	Pb / Cu / Ag / Gold (Au)			No Reaction



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Why copper is used to make hot water tanks and not steel.



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Water

Cu → ✓ donot react with water

Steel → X

Ni
Cr

Alloy → Fe → React with water

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Metal ⟶ Acid

$$Zn + \underset{\text{dil.}}{HCl} \longrightarrow ZnCl_2 + H_2\uparrow$$

Metal + Acid (dil.) → Metal Salt + Hydrogen gas

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C. Metal React with Acids :

- Metal + Dilute acid → Salt + Hydrogen.



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dil.

$$Mg + HCl \rightarrow MgCl_2 + H_2\uparrow$$

dil.

$$Zn + HCl \rightarrow ZnCl_2 + H_2\uparrow$$

Reactivity with Acid

$$Mg > Al > Zn > Fe$$

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Reaction of Mg; Zn; Fe and Cu with acid

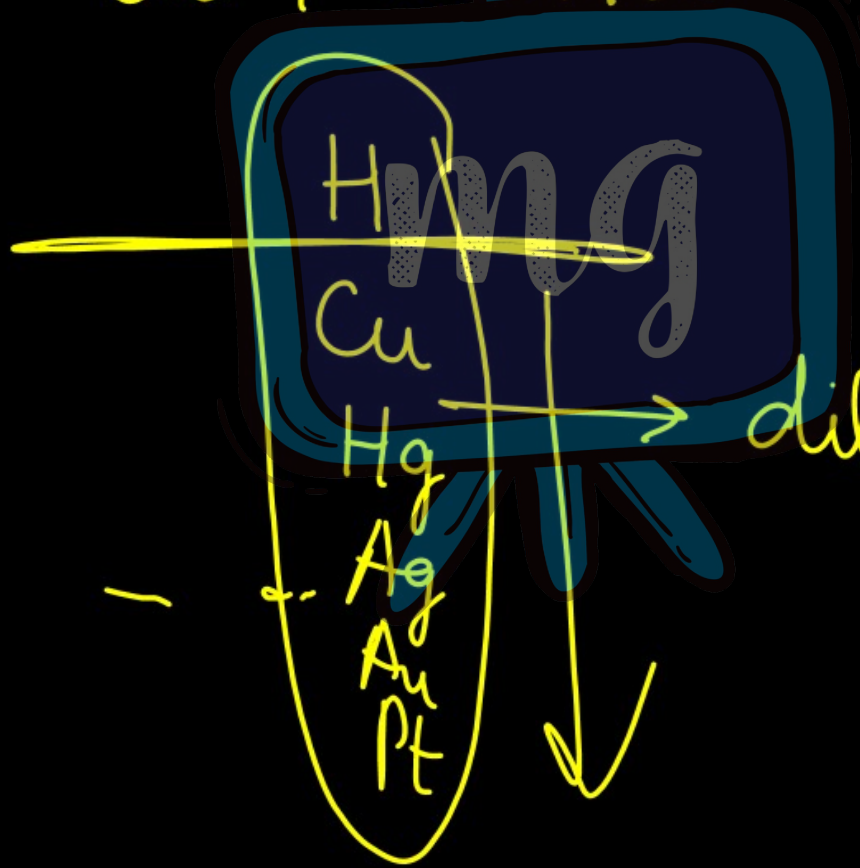
Observation –

- Rate of formation of bubbles was the fastest in the case of magnesium.
- The reaction was also the most exothermic in this case.
- In the case of copper, no bubbles were seen and the temperature also remained unchanged.

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Cu + dil. HCl → ?



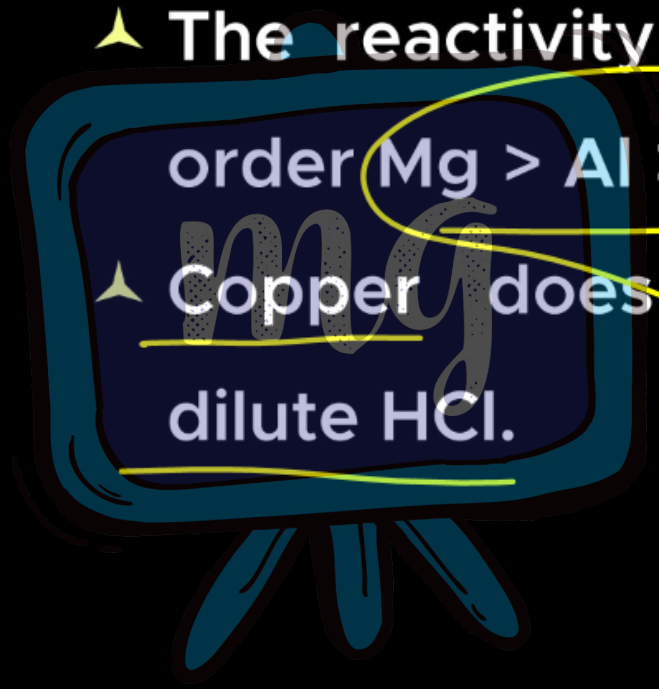
dil HCl / acid → X

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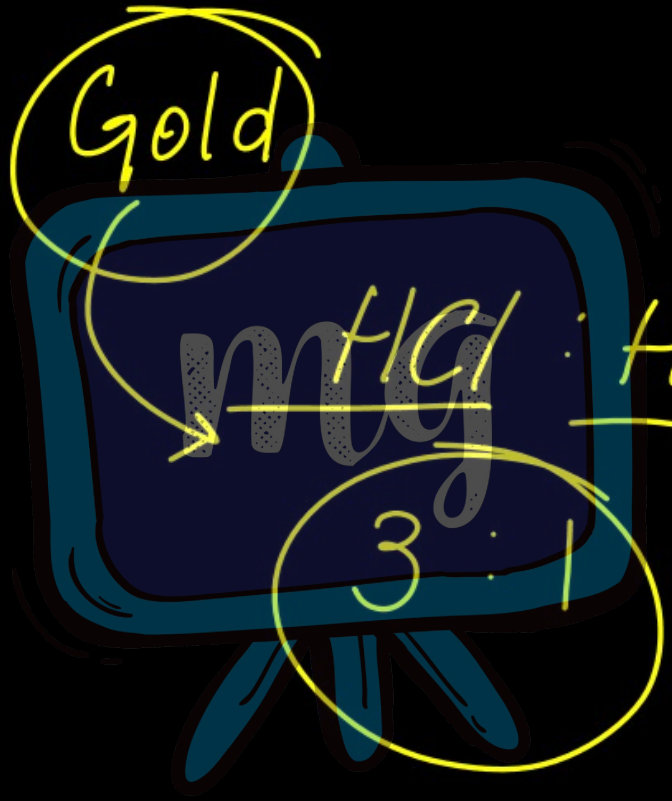
Conclusion —

- The reactivity decreases in the order Mg > Al > Zn > Fe.
- Copper does not react with dilute HCl.



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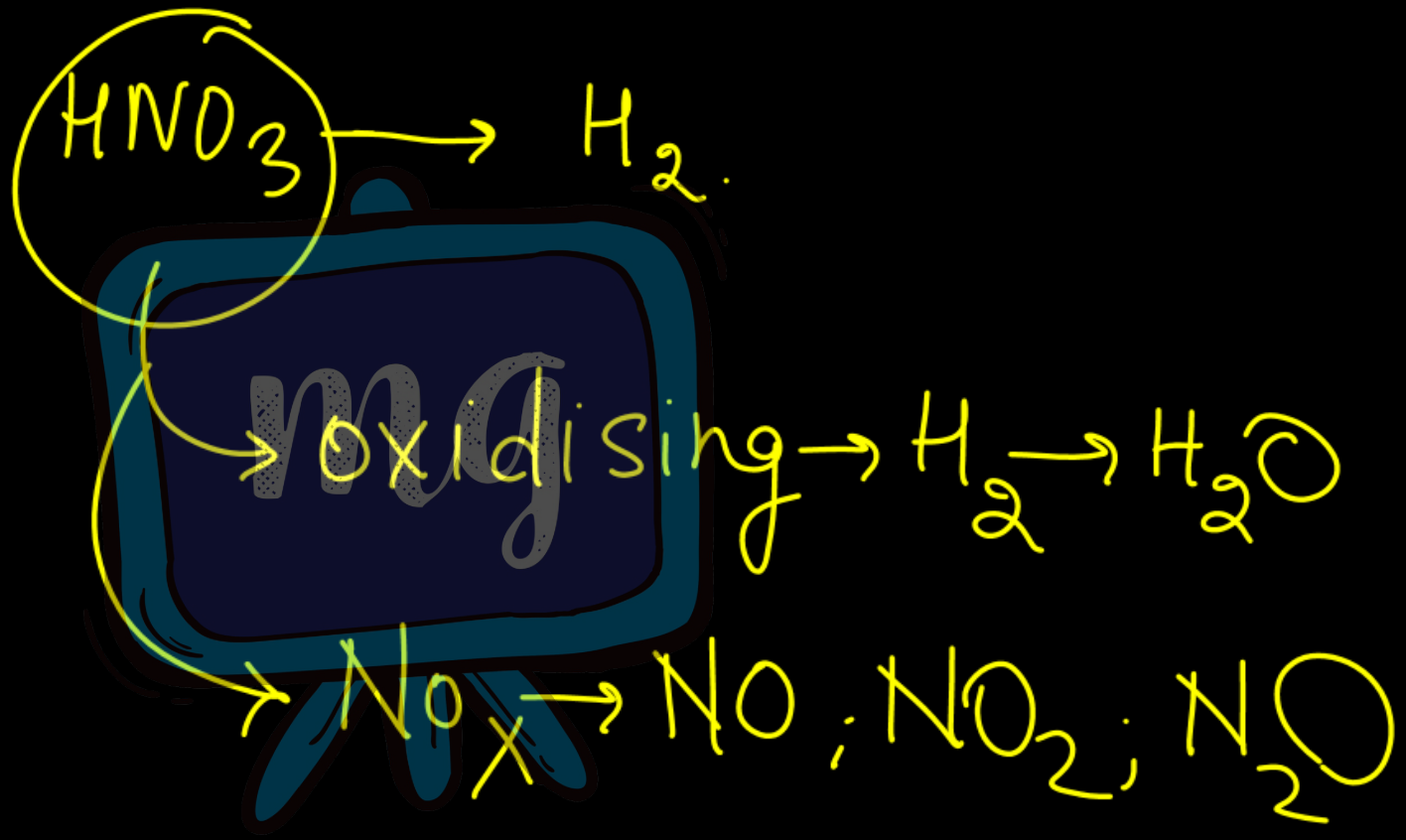
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Reaction of Metals with HNO_3

Hydrogen gas is not evolved when a metal reacts with nitric acid. It is because HNO_3 is a strong oxidising agent. It oxidises the H_2 produced to water and itself gets reduced to any of the nitrogen oxides (N_2O, NO, NO_2). But magnesium (Mg) and manganese (Mn) react with very dilute HNO_3 to evolve H_2 gas.

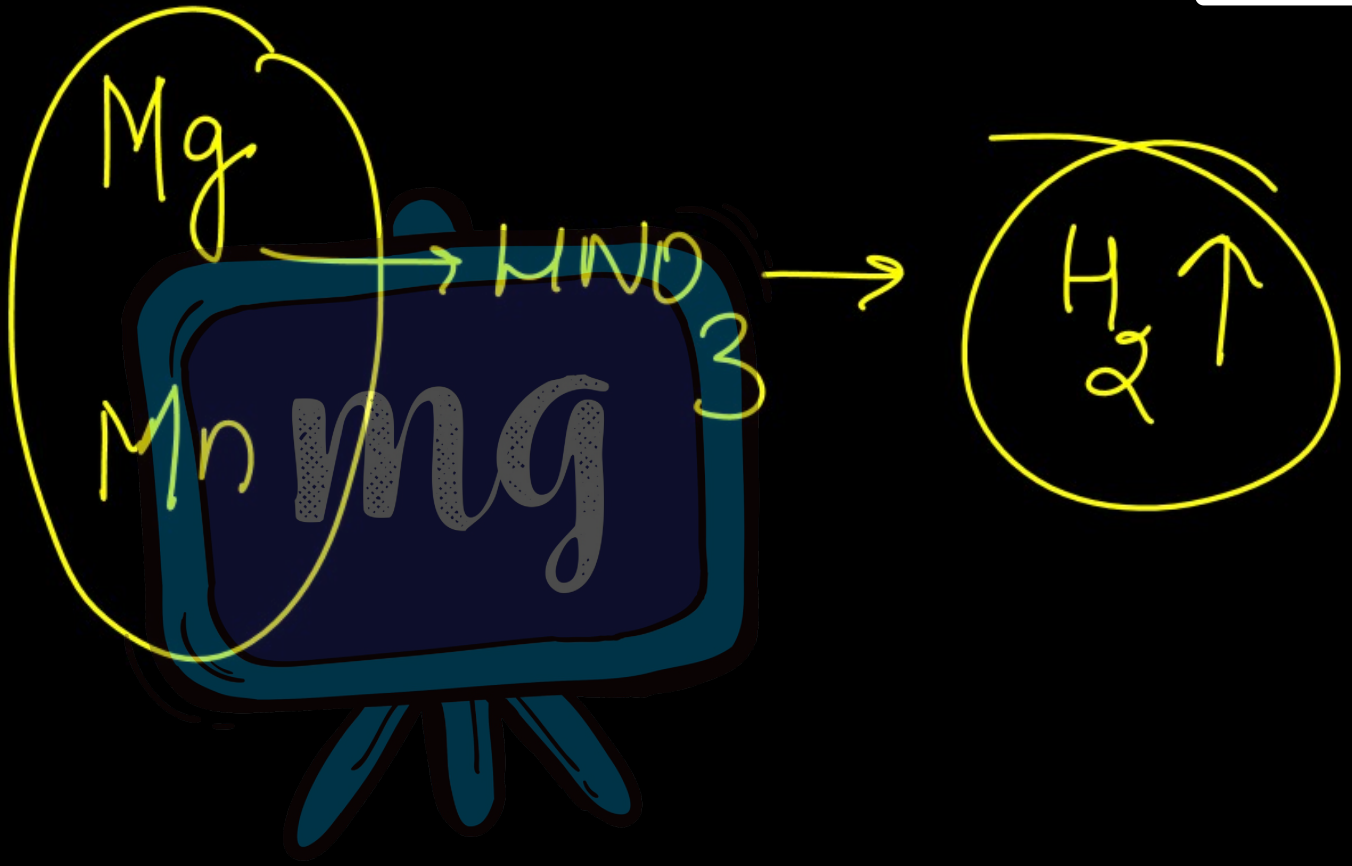
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Aqua Regia —

Aqua Regia → Conc. HCl + Conc. HNO_3

3 : 1

3ml : 1ml

- Aqua regia - royal water.
- It can dissolve gold and platinum.
- It is a highly corrosive fuming liquid.